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# A LEVEL

## Examiners' report

# GEOGRAPHY

## H481
For first teaching in 2016

# H481/03 Summer 2022 series

# Contents

# Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Advance Information for **Summer** 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our [website](#).

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# Paper 3 series overview

There was a full range in the quality of responses and there were responses to all questions on the paper. That said, there is considerable inequality regarding the numbers of candidates attempting questions in the five Options; the two most popular choices are Hazardous Earth and Disease Dilemmas, followed fairly closely by Climate Change. Exploring Oceans and Future of Food are studied by a minority of candidates. It is important to understand that no one Option has a monopoly on high quality responses and scripts in each Option mirror the overall distribution of marks.

It does not appear that any candidates ran out of time in completing their responses. Candidates should remember to write in the left hand margin the number of the question they are answering when they move to an additional booklet and not only at the start of their response. To help with identifying candidates' knowledge and understanding of a particular response that stretches across answer booklets, all scripts should be submitted in question order. The flow of an argument can be hard to follow when it is unclear as to when a response starts, continues or concludes.

Handwriting continues to be an issue. Too often, examiners are unable to make sense of a section of prose simply because there are words and or phrases that they cannot read. Candidates are thus disadvantaging themselves by this failure to communicate effectively.

| Candidates who did well on this paper generally did the following: | Candidates who did less well on this paper generally did the following: |
|---|---|
| • demonstrated secure and substantial knowledge of the Specification content<br>• demonstrated authoritative understanding of the Specification content<br>• demonstrated the ability to apply this knowledge and understanding to the question set. | • demonstrated knowledge of the Specification content that was either inaccurate or was sporadic<br>• demonstrated understanding of the Specification content that was incomplete or muddled<br>• offered responses that were either irrelevant or peripheral to the question set. |

### Assessment for learning

All five Options in this paper are focused on processes and spatial patterns that are highly dynamic. This means that candidates should not rely solely on examples in the textbook but be aware of contemporary events that offer insights into the content of the Options.

# Section A overview

The two sub-parts that make up each question in Section A complement each other. The first sub-part assesses skills in terms of the limitations of a resource while the second asks for an 'explanation' of some aspect of the Option content.

**Assessment for learning**

The three limitations required in sub-part (a) can be delivered successfully as three concise sentences, preferably presented on three separate lines.

## Question 1 (a)

**Topic 3.1 – Climate Change**

1 (a) Identify **three** limitations of **Fig. 1** as a source of information about predicted global surface temperatures. **[3]**

The resource was a map showing predicted global surface temperatures in July, 2020-2039. Limitations identified by candidates tended to focus on the absence of a source, the inconsistent category ranges, especially the highest category, 27°C and above, the cliff edges between categories on the map, that the month of July is in different seasons depending on the hemisphere and that predictions might change across the years.

## Question 1 (b)

(b) Explain the vulnerability of **one** type of natural environment to the impacts of climate change. **[6]**

A clear majority of candidates chose the Arctic tundra to exemplify environmental vulnerability as a result of climate change. Explanations tended to link rising temperatures with thawing of permafrost and consequences for water and carbon cycles. Impacts on the former were securely known and understood whereas the latter were less confidently handled. Other examples of natural environments that candidates wrote about were tropical rainforests and coastal locations. Successful explanations established links between climate change and vulnerability such as rising sea levels and increased erosion of coastlines.

# Question 2 (a)

**Topic 3.2 – Disease Dilemmas**

2    (a)    Identify **three** limitations of **Fig. 2** as a source of information about reported outbreaks of communicable diseases.                                                                                    **[3]**

The resource was a word cloud representing reported outbreaks of communicable diseases superimposed on outlines of the continents. Limitations identified by candidates tended to focus on the absence of a source and therefore the issue of bias and or reliability, the inclusion only of reported outbreaks, the absence of some diseases such as Covid in the UK, inaccuracies concerning the locations of the words, no indication of the significance of either the colours or the sizes of the fonts used.

# Question 2 (b)

**(b)**    Explain the impacts of **one** named disease on resident populations in a country which has experienced a natural hazard.                                                                                    **[6]**

Both of the two exemplars that dominated candidates' responses were effective settings for explanations, cholera in Haiti and Bangladesh. The former followed an earthquake, the latter flooding. Many excellent responses contained detailed explanations of impacts such as illness, both short and longer term, mortality, inability to work and food security issues. Less successful responses tended to offer lengthy accounts of the natural hazard including causes and physical characteristics. These responses did not offer material on the impacts on resident populations.

# Question 3 (a)

**Topic 3.3 – Exploring Oceans**

3    (a)    Identify **three** limitations of **Fig. 3** as a source of information about coral bleaching.    **[3]**

The resource was a map of part of the north-east coastline of Australia displaying open circles representing percentage loss of coral cover. Limitations identified by candidates tended to focus on the congested and overlapping display of the circles, the absence of length of time the loss was registered over, that no absolute data was given or that coral loss is not solely due to coral bleaching.

# Question 3 (b)

**(b)** Explain how acidification of oceans contributes to depleting fish stocks. **[6]**

There were very effective responses that gave detailed and systematic accounts of the effects of ocean acidification on fish stocks. Reducing ability to build mineral skeletons of calcium carbonate for organisms in lower trophic levels was linked to susceptibility to predation and reduced capacity to breed. The consequences for the higher trophic levels of this reduction in food was well understood. Some responses extended their consideration of the topic to include the impacts on corals of the same inability to construct mineral structures and thereby offer reduced protection for fish.

## Misconception

? A significant minority of responses did not understand the role ocean acidification is having and confused it with the bleaching of corals.

Others did not understand that the pH scale is logarithmic and that lower values represent more acid conditions.

# Question 4 (a)

## Topic 3.4 – Future of Food

**4 (a)** Identify **three** limitations of **Fig. 4** as a source of information about food security risks in a dryland area. **[3]**

The resource was a sketch of wheat farming in the Gobi desert. Limitations identified by candidates tended to focus on the absence of a source and the possible bias of this informal representation, the lack of a key or labels or annotations, the absence of information regarding farming techniques such as technology available or information on crops other than wheat.

# Question 4 (b)

**(b)** Explain the physical conditions of an extreme environment where there is indigenous farming. **[6]**

The vast majority of candidates offered the Arctic as an example of an extreme environment. There were a small minority of responses that offered detailed explanations linking the physical conditions of the Arctic (length of growing season, water availability, wind speeds). For the majority, details such as net primary productivity or the actual implications of permafrost for plants such as the restriction on height to be low and for roots to be short were not included. Thus these responses did not offer convincing explanations.

# Question 5 (a)

**Topic 3.5 – Hazardous Earth**

**5** **(a)** Identify **three** limitations of **Fig. 5** as a source of information about volcanic eruptions. **[3]**

The resource was a map from the World Mapper series showing countries with their size determined by the proportion of volcanic eruptions between 2000 and 2017 occurring within their borders. Limitations identified by candidates tended to focus on the difficulty in reading the map due to the degree of distortion of country shape, the absence of accurate and reliable data in some parts of the world, that there is no information regarding the type nor magnitude of the eruptions, the omission of submarine eruptions and the limited time period.

# Question 5 (b)

**(b)** Explain the Park model of disaster-response. **[6]**

There were many excellent responses to this question with a substantial number of candidates choosing to supplement their written material by a labelled diagram. This type of diagram in conjunction with explanatory and detailed text, for example suggesting actual time periods for the x axis (hours, days, weeks, months, years) made for a Level 3 response. The less effective responses tended to omit any reference to what the x and y axes represented. There were a significant minority who did not know what the Park model is.

## Assessment for learning

The use of diagrams for conveying knowledge and understanding should not be under-estimated. A well annotated diagram is a valid form of answering certain styles of questions.

# Section B overview

This section consists of one question in each of the five Geographical Debates Options. Each question links an aspect of the Option content with some element found in one of the compulsory units in the Landscape Systems, Earth's Life Support Systems, Changing Spaces; Making Places or Global Connections units.

The command words deployed, such as examine and assess, invite candidates to consider the links between whatever the two content items are identified in the question. The focus is on how something is impacted, affected or influenced by something else.

The 12 marks are distributed across four Levels with the requirement that the response be written in a paragraphed, full prose style.

## Question 6

**Topic 3.1 – Climate Change**

**6**   Examine how the balance of anthropogenic emissions around the world has been changed by **EITHER** international trade **OR** global migration.                                    **[12]**

The majority of candidates demonstrated secure knowledge of the global changes in anthropogenic emissions, such as the increase in $CO_2$ and $CH_4$ levels in the atmosphere. Most, however, did not offer details of changes in regional trends in emissions nor the long-established high levels of emissions from the USA. It was the absence of an authoritative historical context that meant too many candidates wrote ambiguously. The locational shift in manufacturing from Europe and North America to Asia in particular did not feature in the accounts of many focusing on international trade. Most did not take account of the large scale deforestation occurring in Amazonia and Indo-Malaysia which links with trade in agricultural products such as palm oil and beef.

Discussions concerning global migration tended to pick up on the strong flows of rural to urban and smaller urban to larger urban that are well established across the globe. Comments about the higher energy demands of urban living resulting in rising anthropogenic emissions supported many responses. Others, while making the valid point about such migrations in China, also suggested that a substantial migration into China was responsible for much of the increase in emissions in that country. There is no evidence for such a flow.

# Question 7

## Topic 3.2 – Disease Dilemmas

7    Examine how disease diffusion is affected by physical factors in any **one** landscape system.  **[12]**

The synoptic link here is with one of the three landscape systems studied in the Physical Systems paper, coastal, glaciated and dryland landscapes. A significant number of candidates were confident in their knowledge and understanding of the different types of diffusion. Many responses focused on the role surface water can play in the spread of diseases such as cholera, diarrhoea or malaria. Various elements in landscape systems were also identified as acting as barriers to diffusion such as ice sheets and dryland deserts.

## Exemplar 1

> Another way that p glaciers influence disease diffusion is through the melting of permafrost. As the earths climate gets progressively hotter this causes ice and permafrost to melt. As a result, of this diseases which have been withheld in the frozen permafrost can be released into the atmosphere. An example of this occurs is when a disease none as Anthrax was released back into the air after permafrost melted.

This exemplar illustrates how in the context of glaciated landscapes, candidates drew attention to contemporary changes brought about by global warming thereby releasing diseases previously frozen.

# Question 8

**Topic 3.3 – Exploring Oceans**

**8**   Examine how the accumulation of plastic in oceans influences representations of place.   **[12]**

Candidates studying this Option were well aware of the issue of plastic pollution in its varied forms, microscopic through to relatively large items. Many also focused on describing the accumulation of plastic known as the 'Great Pacific Garbage Patch'. Most did not link this knowledge and understanding with representations of place, one of the key components of the Changing spaces; making places compulsory unit. It was a minority of responses that distinguished between formal and informal representations and were able to offer relevant examples of each in the context of accumulations of plastic. Those that did tended to refer to images of plastic pollution appearing in film / tv documentaries and contrasted these with holiday brochure photographs of pristine beaches.

# Question 9

**Topic 3.4 – Future of Food**

**9**   Examine how strategies to increase food security can be affected by issues of **EITHER** human rights **OR** territorial integrity.   **[12]**

Candidates were generally secure in their understanding of 'food security' but did not often pick up on the need to focus on 'strategies to increase food security'. In the context of either human rights or territorial integrity responses were clear in the threats to food security of a lack of human rights or issues of territorial integrity. Examples such as Syria, Afghanistan or Yemen were effectively deployed to support points. Many also identified that within a general concern about food security some groups of people were more at risk than others. Marginalised groups within a society such as particular religious affiliations, females or refugees were seen as lacking in food security. A few responses discussed the distinction between short and long term food security to very good effect.

# Question 10

## Topic 3.5 – Hazardous Earth

**10**   Examine how volcanic eruptions influence the carbon cycle.                     **[12]**

The details of the carbon cycle were well known and understood by a significant majority of candidates. They distinguished between the slow and fast carbon cycles with the most authoritative offering details such as residence times and using terms such as 'sequester' and 'sink' appropriately. Most candidates were able to link one (usually the fast carbon cycle) or both of these cycles to volcanic eruptions. Comments about the reduction in photosynthesis due to ash fall directly on vegetation or when ash is held in the atmosphere deflecting incoming sunlight were common. Destruction of vegetation due to features of some eruptions such as lava or pyroclastic flows or lahars were also common features of many responses. Less read were links between the subduction of carbon-rich sedimentary rocks at some plate boundaries with the subsequent venting of carbon to the atmosphere in an eruption. Some candidates provided accounts of the impact the recent submarine eruption of Hunga Tonga-Hunga has had on the carbon cycle via its ejection of volcanic ash and gas and in particular water vapour into the stratosphere.

## Question 10

## Topic 3.5 – Hazardous Earth

# Section C overview

This section consists of two questions in each of the five Geographical Debates Options. The command words and phrases used, such as 'Discuss.', 'To what extent…', 'Assess the view that…', or 'How far do you agree?' require candidates to analyse and evaluate the geographical issues raised in the questions. Responses are expected to be fully paragraphed and written in extended prose so that when complete, a response communicates clearly a fully discursive approach.

| **Planning an essay response** |
| --- |
| Even though this is a timed assessment, it is a significant advantage to the writing of a fluent and focused essay discussion that the candidate constructs a plan, however rudimentary. A plan offers a structure that the candidate can return to during the actual writing of the response to keep them focused. |

## Question 11*

### Topic 3.1 – Climate Change

**11\*** 'International responses to climate change will never work.'
Discuss.          **[33]**

The more convincing discussions identified the variety of international responses that have existed over the past few decades. They were secure in their knowledge of the content of the responses which allowed them to evaluate their degrees of success with authority. The Kyoto protocol (in its two commitment periods) and the Paris conference of 2015 were most commonly assessed by candidates. A small minority of discussions included material on COP26 hosted in Glasgow in 2021. A significant proportion of responses included the role of the IPCC with most candidates aware of its advisory position. While there was much effective analysis and evaluation of the international climate change conferences, many candidates extended their discussion to national and sub-national policies. The responses of Denmark and California were often discussed as was the EU's Climate Change programme in particular the Emissions Trading System.

## Question 12*

**12\*** Assess the success of mitigation strategies to cut global emissions of greenhouse gases.    **[33]**

There was much secure knowledge and understanding of the principal mitigation strategies aimed at reducing greenhouse gas (GHG) emissions. Energy efficiency and conservation, fuel shifts, low carbon energy sources, forestry strategies, carbon capture and storage all featured to a greater or lesser extent. Additionally references were made to various strategies that fall under the heading of 'geoengineering'. Analysis and evaluation of these strategies varied considerably. The more convincing arguments tended to be based on up to day information such as facts and figures of what proportion of a country's energy demand was provided by wind power for example. Carbon capture and storage was another example where what is actually happening to several of the schemes did not often figure in candidate responses.

## Question 13*

### Topic 3.2 – Disease Dilemmas

**13*** To what extent can LIDCs or EDCs successfully mitigate against and respond to outbreaks of a communicable disease? **[33]**

There are two key elements in the question that the more convincing discussions picked up on, 'mitigation against' and 'response to'. Of the two elements, 'response to' tended to be omitted by 'reasonable' or 'basic' responses. Overall, candidates tended to rely on a limited range of communicable diseases with cholera and malaria dominating. There were, however, some very effective discussions deploying analysis of ebola outbreaks in West Africa. Many essays included real world exemplification based on Ethiopia's on-going efforts to counter malaria as well as specific reactions to outbreaks.

### Exemplar 2

mosquito populations. The scale of the project has partly contributed to the absence of epidemics during the period 2000 to 2015, when pre-2015/ 2006 epidemics occured every 5 to 8 years. This demonstrates the capacity of LIDCs to dramatically mitigate the outbreaks of the communicable disease malaria. However, it could be argued that this is not independently achieved, as its prevention involves global partners, like NGOs, to reduce transmission in local communities. La

This extract offers an example of a successful analysis and evaluation concluding a section of detailed knowledge and understanding of the example.

Measures taken to mitigate and respond to outbreaks of communicable diseases are a case in point where research undertaken by candidates into the latest strategies can lift the quality of essays. For example, the almost complete elimination of malaria from China and the latest vaccine developments spearheaded by the Gates Foundation.

## Question 14*

**14\*** 'There is a link between disease and levels of economic development.'
Discuss.                                                                                    **[33]**

There were significant numbers of responses that began by offering an account of the epidemiological transition. The three confirmed and emerging fourth phase were well known by considerable numbers of candidates with the more effective descriptions offering real world exemplars of countries fitting each phase. Omran's descriptive model thus offered a suitable scaffold for the discussion. Rising standards of living associated with increasing economic development were highlighted such as the increased provision of clean drinking water and separation of sewage disposal systems. Candidates were secure in their analyses of the decline in communicable disease in EDCs and ACs and the rise in non-communicable diseases in some EDCs and ACs. Evaluation generally came in the context of rising levels of disease such as lung cancers associated with high levels of air pollution. In this context, levels of particulate matter in cities such as Beijing, Delhi and Mexico City were cited. High levels of urban air pollution in some AC cities was not often quoted in evaluations.

Examiners were encouraged to read analyses that considered the role of environmental conditions in fostering conditions leading to the presence of certain diseases, such as malaria. In this context only a few candidates made the telling point that some places possessing a similar set of physical conditions were successful in not experiencing a certain disease. The example of Singapore and malaria for example.

It was in responses to this question that candidates made full use of their material on the Covid pandemic. They were able to point out the impacts this disease has, and continues to have, on the full range of countries, AC, EDC and LIDC. This example also offered the opportunity for evaluation to arise in a political context depending on the attitude of a leader or president. The perceived dismissive attitudes of both Trump and Bolsonaro towards the virulence of Covid was well deployed by many candidates.

Most responses contained material focused on the rise of life non-communicable diseases that ACs are experiencing. Rising levels of type 2 diabetes associated with poor diet and sedentary life styles were often cited.

### Misconception

? A significant minority of responses confused air pollution in the form of particulate matter such as PM 2.5 with $CO_2$ levels as in parts per million. It is the former that is responsible for the considerable rise in risks of developing lung cancer in urban locations.

## Question 15*

**Topic 3.3 – Exploring Oceans**

**15*** 'The oceans are vital to globalisation.'
To what extent do you agree with this statement? **[33]**

Many responses to this question made effective openings by describing the process of globalisation. The majority restricted their accounts to trade in goods with only a minority including the role submarine cables play in data transfer around the globe. Candidates included arguments supporting the question's assertion that used the rapid expansion of trans-ocean shipping from the mid-18th century as a starting point. Contemporary flows of cargoes were mentioned but many did not offer the level of detail that gave real authority to a response. Data on the direction and type of trade across oceans tended only to be cited in a minority of discussions.

The significance to global shipping of the Suez and Panama canals was a feature of many responses with the most convincing references linking these canals to particular trade routes such as Asia to Europe. The inclusion of submarine cables as a key element in globalisation was discussed by a small minority of candidates. The continuing development of these networks and the rising threats to them posed by increasing geo-political tensions in areas such as the North Atlantic and the South China Sea offer much potential for this topic.

A good number of candidates highlighted the disadvantages land-locked countries can face in being distant from ocean access. Additionally, the threat of piracy or restrictions of navigating through 'choke points' was discussed by some to good effect.

## Question 16*

**16*** 'The opportunities arising from the use of ocean resources are greater than the threats.'
Discuss. **[33]**

Candidates answering this question tended to dive straight into a case study led response relying on the facts and figures of each to analyse and evaluate the question. It was only a small minority of responses that set the topic in the context of renewable and non-renewable resources or gave consideration to the role of oceans in providing ecosystem services.

The majority of discussions used the example of krill harvesting and mineral oil extraction to highlight both opportunities and threats. Examiners read a good number of authoritative accounts of both of these resources.

Discussions of the use of renewable energy resources were dominated by tidal energy with only a minority including wave or offshore wind energy. There were those responses that offered effective evaluation of the relative potential of various schemes which were up to date in their knowledge.

## Question 17*

**Topic 3.4 – Future of Food**

**17*** 'Economic factors are the main cause of spatial variation in global food security.'
Discuss.                                                                        **[33]**

Most candidates were generally secure in their understanding of the concept of food security albeit with a diversity of detail when actually defining it. One noticeable contrast concerned whether the candidate drew attention to the differences between chronic and transitory food security. Many candidates made effective use of the Global Hunger Index which because it is recalculated every year offers up to date perspectives on spatial variations. Most responses offered effective analyses and evaluations of economic factors such as land grabbing, issues of availability of capital, technology, specialist advice such as on crop and livestock disease and storage and distribution of foodstuffs.

Non-economic factors in the majority of responses were environmental, especially climatic and the impacts of geo-political tensions such as war.

A minority of responses included the ideas of Malthus and Boserup but tended not to make effective use of them. Candidates did not set these ideas in the details of contemporary population change such as contrasting fertility rates among LIDCs and EDCs. Examiners were given the impression that because a candidate had learned this portion of the content that they were including it without manipulating the material so as to answer the question directly.

## Question 18*

**18*** To what extent is globalisation changing the food industry?                **[33]**

Responses to this question suggested candidates were generally secure in their knowledge and understanding of the process of globalisation. The majority though did not tailor their description of globalisation the better to fit the question. For example, the growth in international trade in agricultural products such as fertilisers and machinery, both of which have clear inter-regional flows.

Most candidates offered convincing comments regarding the diffusion of food styles around the globe. In the context of ACs, the availability of certain foodstuffs all year round was well known with the more authoritative discussions able to offer locational details of where foodstuffs are sourced from. A good number of essays included an evaluation of the issue of food miles. The key point being made being that the reduced energy cost of growing some foods in distant places outweighs the transport costs. Only a small minority of candidates made effective arguments concerning the inequalities between TNCs and smaller scale suppliers with the most convincing able to name appropriate agri-business operations such as Dole or Cargill. Likewise it was the minority of responses that referenced actual retail TNCs such as Walmart, Lidl or Costco.

A good number of candidates drew on the recent events in Ukraine to support their arguments regarding the globalisation of supply of certain products. They were convincing in their accounts of the impacts of grain shortages on food shortages in certain regions of the globe. Evaluation from some candidates came from a consideration of the positive impacts of a globalised food industry such as the provision of short term food relief and the innovations in technology that can have beneficial effects for farmers around the globe.

# Question 19*

## Topic 3.5 – Hazardous Earth

**19\*** 'The most effective strategy to manage tectonic hazards is to mitigate against vulnerability.'
To what extent do you agree with this statement? **[33]**

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The vast majority of candidates were secure in their knowledge of the diversity of tectonic hazards. Their understanding of the impacts of these hazards was less secure for a significant number. For example understanding the nature and effect of a lahar flow on people and property or linking how seismic energy causes building collapse via primary (P), secondary (S) and surface (L) waves.

Many candidates opted to structure their response around case study material. This had the potential to be highly successful as long as the example's details were used to answer the question explicitly, that is with a focus on mitigation against vulnerability. Some responses considered vulnerability in terms of more than simply people. This minority of responses offered comments about impacts on infrastructure such as utilities, on agriculture and on environment such as vulnerable ecosystems. As well hazard mapping and land use zoning, candidates included mitigations such as education and community preparedness, prediction and warning systems and building design aimed at resisting the impacts of hazards.

The vast majority of candidates recognised the contrasting challenges when dealing with managing volcanic vis a vis seismic hazards. For example most discussions drew attention to the near impossibility of issuing warnings of seismic events although analysis of the Great East Japan earthquake: Tōhoku by a good number of candidates referred to the warnings that were able to be given in the few minutes before the actual high energy event struck. In the context of volcanic eruptions essays pointed to the ability to register indicators of impending eruptions as an effective strategy as long as the resources were available to carry out detection and then to communicate to those at risk.

Comparisons of countries at different points along the development continuum, AC, EDC or LIDC were much used to offer evaluation, with Japan, Indonesia and Nepal frequently cited. Additionally, tectonic events of contrasting magnitudes were quoted in order to analyse and evaluate the question to generally good effect.

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## Question 20*

**20\*** 'The hazards generated by earthquakes have greater impact on people than those from volcanic eruptions.'
Discuss.                                                                                            **[33]**

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The second question in the Hazardous Earth option asks for a direct comparison between seismic and volcanic events in terms of their respective impacts on people. As with the first question in the option, candidates mostly organised their responses around case study material. Again, as with Question 19, success depended on how well the exemplar material was focused on the actual question rather than simply replicated. The examples that tended to be chosen were the Great East Japan earthquake: Tōhoku 2011, Gorkha earthquake Nepal 2015, L'Aquila, Italy 2009, Haiti, 2010, Mount Merapi, Indonesia 2010, Mount Ontake, Japan 2014, Mount Nyiragongo, Democratic Republic of Congo 2002 and Eyjafjallajökull, Iceland 2010.  Each one of these tectonic events had potential to support in different ways the various arguments put forward by candidates.

It was important that candidates offered authoritative material on 'impacts' which many did. Not only were primary effects noted such as destruction of buildings and infrastructure, but also many responses included secondary impacts such as dislocation of local populations and overcrowding of refugee camps, such as in the context of the eruptions of Mount Merapi and Mount Nyiragongo. Impacts that affected people and places spatially distant from the origin of either an earthquake or volcanic eruption were a feature of those responses using the Great East Japan earthquake: Tōhoku and the Eyjafjallajökull eruption.

For 'thorough' or 'comprehensive' analysis and evaluation, examiners expected to read prose that explicitly compared and contrasted impacts.

Many candidates suggested contrasting levels of impacts but did not pay attention to the considerable differences in magnitude of hazard events. For example comparing the 9.0 MW Great East Japan earthquake: Tōhoku with the VEI 2 eruption of Mount Merapi.

Some candidates included discussions that drew on hazard events in the historic past such as the Laki, Iceland eruption of 1783 or the eruption of Krakatoa, Indonesia in 1883. These were used to highlight how some high magnitude events have the capability of impacting people on a global scale and over an extended period of time via weather patterns for example. In this context, speculation regarding the potential impacts of the eruption of a super-volcano such as Yellowstone or Toba was appropriate.

Evaluation that compared similar magnitude events, both seismic and volcanic, occurring in contrasting socio-economic contexts such as AC, EDC or LIDC were helpful, difficult as it is to pair together earthquakes and volcanoes. Most candidates concluded that it was not straightforward to say if earthquakes or volcanic eruptions have the greater impact on people.

## Exemplar 3

Earthquakes produce seismic waves when pressure at the focus waves, these waves come in three forms being P, S and L waves. L waves cause the most destruction as they have a vertical rolling motion. The seismic waves result in further hazards as seen in the Great Japan Earthquake on March 11th 2011. The earthquake came from an off shore area just 40km beneath the surface meaning it was a shallow focus earthquake measured at 9MW. The earthquake caused a displacement of water in the ocean leading to a 40.5m high Tsunami as a result of the earthquake. The tsunami

Candidates were generally secure in their knowledge of the range of hazards both earthquakes and volcanoes can generate. This extract highlights comprehensive knowledge and understanding.

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